Results

A) ***Demographic data*** *(tables 1-4):*

Table (1): Age distribution among SCD patients and control groups

Variable	Patients (n=50)	Control (n=25)	t	p
Age in years			-0.839	0.404
Range	2.5-18	3-16		
Mean±SD	9.210±4.593	10.080±3.378		

There was no significant difference regarding age distribution among patients and control groups (P > 0.05).

Table (2): Sex distribution among patients and control groups

Variable	Patients (n=50)		Control (n=25)		$\chi 2$	p
	n	%	n	%		
Sex					0.681	0.409
Male	27	54	16	64		
Female	23	46	9	36		

There was no significant difference regarding sex distribution among patients and control groups (P > 0.05).

Table (3): Family history of SCD among patients

Family history of SCD	Patients' group (n=50)	
	Number	Percentage
Positive	14	28
Negative	36	72

Patients with SCD showed positive family history of the disease in 28% of cases, but the majority (72%) showed negative family history of the disease.

Table (4): Consanguinity among patients

Consanguinity	Patients' group (n=50)	
	Number	Percentage
Positive	32	64
Negative	18	36

Patients with SCD showed positive consanguinity in 64% of cases, while 36% showed negative consanguinity.

B) Neurological complications *(table 5):*

Table (5): Neurological complications among patients and control groups

Neurological Complications	Patients (n=50)		Control (n=25)		χ^2	p
	n	%	n	%		
Headache	33	66	2	8	22.527	<0.001*
Cognitive decline [1]	24	48	0	0	17.647	<0.001*
Seizures					8.607	0.014*
Focal	9	18	0	0		
Generalized	5	10	0	0		
Diminution of vision [2]	12	24	0	0	5.469	0.019*
Stroke					3.860	0.277
Ischemic arterial	3	6	0	0		
Ischemic venous	2	4	0	0		
Hemorrhagic	2	4	0	0		

[1] *Especially knowledge and working memory domains;* [2] *Proliferative retinopathy*

There was statistically significant difference regarding neurological complications especially headache, cognitive decline, seizures and visual affection. Headache was the most frequent complication followed by cognitive decline among patients compared with control group (**P<0.05**). Meantime the difference wasn't significant regarding ischemic (arterial, venous) stroke and hemorrhagic stroke among patients compared with control group (**P>0.05**) that represented the least frequent complication.

C) Neurological examination (table 6):

Table (6): Neurological examination of patients

Neurological Examination	Patients' group (n=50)	
	Number	Percentage
Transient ischemic attacks	**9**	**18**
Side weakness	5	10
Side numbness	2	4
Speech disorder	2	4
Motor weakness (hemiplegia)	**5**	**10**
Speech or language disturbance	**4**	**8**
Cranial nerve affection (UMN facial palsy)	**5**	**10**
Sensory affection (right side numbness)	**1**	**2**

Neurological examination of patients revealed many abnormalities. It showed that transient ischemic attacks represented the most frequent abnormal examination (18%) with 10% presented by side weakness and 4% presented by side numbness together with speech disorder in 4% of patients. This was followed by weakness and cranial nerve affection (10%). Right side numbness represented the least frequent abnormal examination (2%).

D) Investigations:

- ***Laboratory investigations*** *(tables 7-12)*

Table (7): Complete blood picture findings among patients and control groups

CBC finding	Patients (n=50)	Control (n=25)	t	p
Hb (gm/100ml)			-10.590	<0.001*
Range	4.2-13	11-16		
Mean±SD	8.182±2.255	13.360±1.319		
MCV (fl)			0.903	0.370
Range	76-99	78-94		
Mean±SD	85.370±6.349	84.080±4.600		
Platelets (/cmm)			3.360	0.001*
Range	100,000-750,000	150,000-430,000		
Mean±SD	370,380±192.945	234,000±86.795		
WBC (/cmm)			5.473	<0.001*
Range	4,000-51,000	4,000-15,000		
Mean±SD	21,040±12.135	7400±3.775		
Reticulocyte count (%)			7.281	<0.001*
Range	0.5-20	0.5-2		
Mean±SD	9.004±5.416	1.076±0.466		

CBC: Complete blood picture; Hb: Hemoglobin; MCV: Mean corpuscular volume; WBC: White blood cells

CBC findings including all elements (Hb, platelets, WBC) and reticulocyte count were significantly higher in patients, while non-significant difference was found regarding values of MCV among patients in comparison to control group (**P<0.05**).

Table (8): Hb electrophoresis results among patients

Hb electrophoresis	Patients' group (n=50)	
	Number	Percentage
SCA	30	60
SCT	20	40

SCA: Sickle cell anemia; SCT: Sickle cell trait

By Hb electrophoresis, patients with SCD were diagnosed as SCA in 60 % of cases, while 40% were diagnosed as SCT.

Table (9): Serum electrolytes findings among patients and control groups

Serum electrolytes	Patients (n=50)	Control (n=25)	t	p
Na (mmol/l)			5.135	<0.001*
Range	130-145	125-140		
Mean±SD	137.500±3.376	133.000±3.958		
K (mmol/l)			2.584	0.012*
Range	3.4-5.5	3-5.4		
Mean±SD	4.584±0.604	4.156±0.804		

Serum electrolytes levels **(Na, k)** were significantly higher in patients in comparison to with control group (**P<0.05**)

Table (10): Protein C & protein S levels among patients and control groups

Variable	Patients (n=50)	Control (n=25)	t	p
Protein C (IU/dl)			-5.684	<0.001*
Range	50-120	85-160		
Mean±SD	92.400±16.956	117.120 ±19.279		
Protein S (IU/dl)			-3.413	0.001*
Range	40-110	75-120		
Mean±SD	84.740±17.065	97.360±9.928		

Normal values: Protein C: 70-160 IU/dl; Protein S: 60-150IU/dl

Protein C & Protein S levels were significantly lower among patients in relation to control group **(P < 0.05).**

Table (11): Renal function tests findings among patients and control groups

Renal Function Tests	Patients (n=50)	Control (n=25)	t	p
Urea (mg/dl)			1.859	0.067
Range	15-100	15-40		
Mean±SD	30.160±12.250	25.280 ±6.542		
Creatinine (mg/dl)			0.891	0.376
Range	0.5-4.5	0.5-1.2		
Mean±SD	0.978±0.557	0.876±0.176		

There was no significant difference regarding range of renal function tests findings including urea and creatinine levels among patients compared with control group **(P > 0.05)**.

Table (12): Liver function tests findings among patients and control groups

Liver Function Tests	Patients (n=50)	Control (n=25)	t	p
Bilirubin (mg/dl)			4.951	<0.001*
Range	0.1-5	0.1-0.9		
Mean±SD	2.028±1.507	0.524±0.217		
ALT (IU/L)			2.914	0.005*
Range	25-100	25-42		
Mean±SD	40.040±12.974	32.200±4.822		

ALT: Alanine aminotransferase

Total bilirubin and ALT levels were significantly higher among patients in relation to control group (**P<0.05**).

- *Neuroimaging*

Table (13): Magnetic resonance imaging findings among patients

MRI findings	Patients' group (n=50)	
	Number	Percentage
Normal	34	68
Ischemic Stroke	13	26
Hemorrhagic Stroke	2	4
Marked atrophy without vascular insult	1	2

MRI: Magnetic Resonance Imaging

MRI brain in patients was normal in most patients (68%). It showed vascular insult, either ischemic stroke in 26% of patients, or hemorrhagic stroke in only 4% of patients, and it also showed marked atrophic changes without vascular insult in only 2% of patients.

- *Transcranial color-coded duplex (TCCD)*

Table (14): Transcranial color-coded duplex findings among patients and control groups

TCCD	Patients (n=50)		Control (n=25)		$\chi 2$	p
	n	%	n	%		
Velocity					32.813	<0.001*
Very low	2	4	0	0.00		
Low	28	56	0	0.00		
Normal	15	30	25	100.00		
Conditioned	1	2	0	0.00		
High	4	8	0	0.00		

Very low: < 20cm/sec; Low: < 70cm/sec; Normal: < 170cm/sec; Conditional: >170 /sec but < 200 cm/sec dICA, MCA, intracranial bifurcation; Abnormal or high: > 200cm/sec MCA, intracranial bifurcation, dICA.

There was statistically highly significant difference regarding transcranial duplex findings among patients compared with control group (**P<0.05**), with the largest number of patients (n= 28) (56%) matching with low velocity. Patients with high velocity only represented 8% of patients followed by those with very low velocity (4%).

- ***Electroencephalogram*** *(table 15-16):*

Table (15): EEG findings among patients

EEG findings	Patients' group (n=50)	
	Number	Percentage
Normal	39	78
Focal activity	6	12
Multifocal	3	6
Focal with secondary generalization	1	2
Generalized	1	2

EEG showed many abnormalities in patients with most patients had focal activity (12%) followed by multifocal activity (6%), but only 2% had focal activity with secondary generalization and 2% had generalized activity.

Table (16): Relation between EEG findings and clinical presentation of seizures among patients

EEG	Seizures						χ2	p
	Negative		Focal		Generalized			
	n	%	n	%	n	%		
EEG finding							61.396	<0.001*
Normal	36	100	1	11.1	2	40		
Focal activity	0	0	6	66.7	0	0		
Multifocal	0	0	2	22.2	1	20		
Focal with 2ry generalization	0	0	0	0.00	1	20		
Generalized	0	0	0	0.00	1	20		

There was statistically highly significant difference regarding relation between EEG findings and clinical presentation of seizures among studied patients (**P<0.05**). Most patients who presented by focal seizures had focal activity in EEG (66.67%), while 22.22% had multifocal activity in EEG and 11.11% had normal EEG. Most patients who presented by generalized seizures had normal EEG (40%) followed by equal percentages (20%) for those who had multifocal, focal with secondary generalization and generalized activity in EEG.

- ***Stanford-Binet Intelligence Quotient (IQ)*** *(table 17)*

Table (17): Stanford-Binet Intelligence Quotient results among patients and control groups

Stanford-Binet Intelligence Quotient	Patients (n=50)		Control (n=25)		χ^2	p
	n	%	n	%		
Grades					16.832	0.005*
Mild impaired (55-69)	14	28	1	4		
Borderline (70-79)	7	14	3	12		
Low average (80-89)	3	6	9	36		
Average (90-109)	25	50	10	40		
High average (110-119)	1	2	1	4		
Superior (120-129)	0	0	1	4		

There was statistically significant difference regarding grades of Stanford-Binet Intelligence Quotient among patients compared with control group (**P<0.05**), where the largest number of patients (50%) presented in the grade "average" followed by the grade of "mild impaired" that represented 28% of patients.

*E) **Management** (table 18):*

Table (18): Different lines of treatment among patients

Line of treatment	Patients' group (n=50)	
	Number	Percentage
Medical		
Hydroxyurea	47	94
Desferoxamine	20	40
Ursofalk	26	52
Antiplatelet	12	24
Antiepileptic drugs	11	22
Blood transfusion		
No	0	0
Regular	49	98
Irregular	1	2
Blood exchange during crisis		
Positive once	1	2
Positive twice	3	6
Positive 4 times	1	2

Patients with SCD were on regular medical treatment including different drugs with most patients were on hydroxyurea (94%) and ursofalk (52%), but only 24% of patients were on antiplatelets. Almost all patients with SCD had regular blood transfusion (98%). About one third of the patients (32%) had regular blood transfusion every 2 months, and only 10% had yearly transfusion, 2% had irregular blood transfusion. Patients with SCD had blood exchange during crisis twice in 6% of cases, but 2% had exchange once and 2% had exchange 4 times.

F) Risk factors for stroke in SCD:

- ***Level of protein C & protein S*** *(table 19-22)**:***

Table (19): Relation between level of protein C & protein S and type of clinical stroke among patients

Type of stroke	Protein C (IU/dl)	Protein S (IU/dl)
	Mean±SD	Mean±SD
Negative (n=43)	95.116±13.429	88.000±13.420
Ischemic arterial stroke (n=3)	67.667±18.583	68.333±32.146
Ischemic venous stroke (n=2)	53.500±4.950	44.500±6.364
Hemorrhagic stroke (n=2)	110.000±0.000	79.500±6.364
F	10.725	7.196
p	<0.001*	<0.001*

There was statistically highly significant difference regarding relation between decreased level of protein C & protein S and type of clinical stroke in patients (**P<0.05**), with evident decrease in both protein C and protein S levels in patients with ischemic venous stroke (mean was 53.500 for protein C and 44.500 for protein S).

Table (20): Relation between level of protein C & protein S and MRI brain findings among patients

MRI brain finding	Protein C (IU/dl)	Protein S (IU/dl)
	Mean±SD	Mean±SD
Normal (n=34)	95.65±12.227	89.94±12.130
Ischemic stroke (n=13)	80.62±22.937	71.92±22.845
Hemorrhagic stroke (n=2)	110.00±0.00	79.50±6.364
Marked atrophy without vascular insult (n=1)	100	85
F	0.623	0.890
p	0.875	0.613

There was no statistically significant difference regarding relation between decreased level of protein C & protein S and MRI brain finding in patients (P>0.05).

Table (21): Relation between level of protein C & protein MRA brain finding among patients.

MRA brain finding	Protein C (IU/dl)	Protein S (IU/dl)
	Mean±SD	Mean±SD
Normal (n=48)	93.88±15.621	86.188±15.781
Moyamoya syndrome (n=2)	57.00±2.828	50.00±7.071
Z	-2.234	-2.181
p	0.025*	0.029*

There was statistically significant difference regarding relation between decreased level of protein C & protein S and MRA brain finding (**P<0.05**), with evident decrease in both protein C and protein S levels in Moyamoya syndrome (mean was 57 for protein C and 50 for protein S).

Table (22): Relation between level of protein C & protein S MRV brain finding among patients

MRA brain finding	Protein C (IU/dl)	Protein S (IU/dl)
	Mean±SD	Mean±SD
Normal (n=48)	94.021±15.236	86.417±15.198
Sinus thrombosis (n=2)	53.500±4.950	44.500±6.364
Z	-2.334	-2.334
p	0.020*	0.020*

There was statistically significant difference regarding relation between decreased level of protein C & protein S and MRV brain finding (**P<0.05**), with evident decrease in both protein C and protein S levels in patients with sinus thrombosis (mean was 53 for protein C and 44 for protein S).

- ***Platelet count*** *(table 23-24)*

Table (23): Relation between platelet count and type of clinical stroke among patients

Clinical stroke	Platelets (10^3/cmm)	F	p
	Mean±SD		
Type		5.972	0.002*
Negative (n=43)	343.395±176.121		
Ischemic arterial stroke (n=3)	707.667±43.547		
Ischemic venous stroke (n=2)	590.000±14.142		
Hemorrhagic stroke (n=2)	225.000±77.782		

There was statistically significant difference regarding relation between platelet count and type of clinical stroke in patients (P<0.05), with evident increase in platelet count in both ischemic arterial and venous stroke (mean values were 707.667 and 590.000 respectively).

Table (24): Relation between platelets number and MRI brain finding among patients

MRI Brain	Platelets (10^3/cmm)	F	p
	Mean±SD		
MRI brain finding		14.118	<0.001*
Normal (n=34)	286.47±130.567		
Ischemic stroke (n=13)	596.85±149.247		
Hemorrhagic stroke (n=2)	225.00±77.782		
Marked atrophy without vascular insult (n=1)	570.00		

There was statistically highly significant difference regarding relation between platelet count and MRI brain finding in patients (**P<0.05**), with evident increase in platelet count in ischemic stroke (mean was 596.85). Only one patient showed marked atrophic changes without vascular insult in MRI brain, with a platelet count 570 (10^3/cmm).

- ***White blood cell count*** *(table 25-26)*

Table (25): Relation between WBC count and type of clinical ischemic stroke among patients

Clinical stroke	WBC (10^3/cmm)	F	p
	Mean±SD		
Type		7.655	<0.001*
Negative (n=43)	18.302±10.451		
Ischemic arterial stroke (n=3)	41.000±8.544		
Ischemic venous stroke (n=2)	39.000±8.485		
Hemorrhagic stroke (n=2)	32.000±2.828		

There was statistically highly significant difference regarding relation between WBC count and type of clinical stroke in patients **(P<0.05)**, with evident increase in WBC count in patients with ischemic arterial stroke (mean was 41.000) followed by those with ischemic venous stroke (mean was 39.000).

Table (26): Relation between WBC count and MRI brain finding among patients

MRI Brain	WBC (10^3/cmm)	F	p
	Mean±SD		
MRI brain finding		2.092	0.041*
Normal (n=34)	15.09±7.994		
Ischemic stroke (n=13)	34.85±9.898		
Hemorrhagic stroke (n=2)	31.50±0.707		
Marked atrophy without vascular insult (n=1)	22		

There was statistically significant difference regarding relation between WBC count and MRI brain finding in patients (**P>0.05**). The highest cont was in patients with ischemic stroke (mean was 34.85) followed by those with hemorrhagic stroke (mean was 39.000). The least risk was in normal MRI (mean was 15.09). Only one patient showed marked atrophic changes without vascular insult in MRI brain, with a WBC count 22 (10^3/cmm).

Table (27): Relation between regularity of blood transfusion and occurrence of ischemic arterial stroke among patients

Patients	Blood transfusion				χ2	P
	Regular (n=49)		Irregular (n=1)			
	n	%	n	%		
Ischemic arterial stroke					FET	0.060
Yes (n=3)	2	4.1	1	100		
No (n=47)	47	95.9	0	0		

No statistically significant difference was found regarding relation between regularity of blood transfusion and occurrence of ischemic arterial stroke among patients (P>0.05). Only 4.1% of patients with regular blood transfusion had ischemic arterial stroke.

G) Blood transfusion and TCCD:

Table (28): Relation between regularity of blood transfusion and transcranial duplex findings among patients

TCCD	Blood transfusion				χ2	P
	Regular (n=49)		Irregular (n=1)			
	n	%	n	%		
Velocity					FET	0.058
Very low	1	2	1	100		
Low	28	57.1	0	0		
Normal	15	30.6	0	0		
Conditioned	1	2	0	0		
High	4	8.2	0	0		

No statistically significant difference was found regarding relation between blood transfusion regularity and TCCD findings among patients (P>0.05). Most patients with regular blood transfusion had TCCD with low (57.1%) and normal (30.6) velocity in all interpreted vessels.

H) MRI brain and seizures

Table (29): Relation between MRI brain findings and seizures among patients

MRI brain	Seizures						χ2	p
	Negative (n=36)		Focal (n=9)		Generalized (n=5)			
	n	%	n	%	n	%		
MRI brain finding							18.342	0.005*
Normal	29	80.6	4	44.4	1	20		
Ischemic stroke	6	16.7	4	44.4	3	60		
Hemorrhagic stroke	1	2.8	1	11.1	0	20		
Marked atrophy without vascular insult	0	0	0	0.00	1	20		

There was statistically highly significant difference regarding relation between MRI brain finding and seizures among patients (**P<0.05**). Patients with no seizures mainly had normal MRI brain (80.6%), while 60% of patients with generalized seizures had ischemic stroke in MRI brain.

I) MRI brain and EEG findings

Table (30): Relation between MRI brain findings and presence of epileptiform activities in EEG among patients.

MRI brain	Epileptiform activities in EEG				χ2	P
	Yes (n=11)		No (n=39)			
	n	%	n	%		
MRI brain finding					12.319	0.006*
Normal	3	27.3	31	79.5		
Ischemic stroke	6	54.5	7	17.9		
Hemorrhagic stroke	1	9.1	1	2.6		
Marked atrophy without vascular insult	1	9.1	0	0		

There was statistically highly significant difference regarding relation between MRI brain findings and presence of epileptiform activities in EEG among patients (**P<0.05**), where most patients (79.5%) with no epileptiform activities in EEG had normal MRI brain. Nearly half of the patients (54.5%) with epileptiform activities in EEG had ischemic stroke in MRI brain.

J) MRI brain and cognitive decline:

Table (31): Relation between MRI brain findings and cognitive decline among patients

MRI brain	Cognitive decline (1)				χ2	P
	Yes (n=24)		No (n=26)			
	n	%	n	%		
MRI brain finding					10.942	0.012*
Normal	11	45.8	23	88.5		
Ischemic stroke	10	41.7	3	11.5		
Hemorrhagic stroke	2	8.3	0	0		
Marked atrophy without vascular insult	1	4.2	0	0		

(1) *knowledge and working memory domains*

There was a statistically significant difference regarding relation between MRI brain finding and cognitive decline among patients **(P < 0.05)**, where most patients without cognitive decline (88.5%) had normal MRI brain. Patient with cognitive decline mostly had either normal MRI brain (45.8%) or ischemic stroke in MRI brain (41.7%).

K) MRI brain and Stanford-Binet Intelligence Quotient

Table (32): Relation between MRI brain findings and Stanford-Binet Intelligence Quotient grades among patients

MRI brain	Stanford-Binet Intelligence Quotient									
	Mild impaired (n=14)		Borderline (n=7)		Low average (n=3)		Average (n=25)		High average (n=1)	
	n	%	n	%	n	%	n	%	n	%
MRI brain finding										
Normal	1	7.1	7	100	3	100	22	88	1	100
Ischemic stroke	10	71.4	0	0	0	0	3	12	0	0
Hemorrhagic stroke	2	14.3	0	0	0	0	0	0	0	0
Marked atrophy without vascular insult	1	7.1	0	0	0	0	0	0	0	0
χ^2	MCET									
p	0.032*									

There was a significant difference regarding relation between MRI brain abnormalities and Stanford-Binet Intelligence Quotient grades among patients **(P < 0.05)**. Most patients (71.4%) within the grade mild impaired had ischemic stroke in MRI brain.

L) *Multiple regression analysis of cognitive decline, MRI brain, EEG findings and clinical stroke*

Table (33): Multiple regression analysis according to level of protein C

	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
Cognitive decline	2.936	5.300	0.087	0.554	0.582
MRI brain findings	-1.982	2.805	-0.256	-0.706	0.484
EEG findings	-3.548	3.228	-0.179	-1.099	0.278
Clinical stroke	0.769	7.988	0.033	0.096	0.924
Dependent Variable: Protein C level					

There was positive correlation between decreased level of protein C and risk for cognitive decline, MRI brain, EEG abnormalities and stroke with the highest predictive value for MRI brain abnormalities risk (Beta: -0.256).

Table (34): Multiple regression analysis according to level of protein S

	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
Cognitive decline	-1.033	4.855	-0.031	-0.213	0.832
MRI brain findings	-4.203	2.569	-0.541	-1.636	0.109
EEG findings	-2.219	2.957	-0.111	-0.750	0.457
Clinical stroke	2.938	7.318	0.124	0.401	0.690
Dependent Variable: Protein S level					

There was positive correlation between decreased level of protein S and risk for cognitive decline, MRI brain, EEG abnormalities and stroke with the highest predictive value for MRI brain abnormalities risk (Beta: -0.541).

Table (35): Multiple regression analysis according to irregular Blood transfusion

	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
Cognitive decline	0.673	0.704	0.143	0.956	0.344
MRI brain findings	-0.448	0.372	-0.414	-1.203	0.235
EEG findings	0.668	0.429	0.240	1.558	0.126
Clinical stroke	2.003	1.061	0.609	1.889	0.065
Dependent Variable: Irregular Blood transfusion					

There was positive correlation between irregular blood transfusion and risk for cognitive decline, MRI brain, EEG abnormalities and stroke with the highest predictive value for stroke risk (Beta: 0.609).

Table (36): Multiple regression analysis according to transcranial duplex abnormalities.

	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
Cognitive decline	0.137	0.229	0.088	0.600	0.552
MRI brain findings	0.165	0.121	0.410	1.364	0.179
EEG findings	-0.389	0.139	-0.421	-2.791	0.008*
Clinical stroke	-0.702	0.345	-0.644	-2.036	0.048*
Dependent Variable: Transcranial duplex abnormalities					

There was positive correlation between transcranial duplex abnormalities and risk for cognitive decline, MRI brain, EEG abnormalities and stroke with the highest predictive value for stroke risk (Beta: -0.644).

Table (37): Multiple regression analysis according to non- complaint medical treatment with hydroxyurea.

	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
Cognitive decline	0.068	0.059	0.144	1.161	0.252
MRI brain findings	-0.117	0.031	-1.075	-3.774	<0.001*
EEG findings	0.088	0.036	0.345	2.467	0.017*
Clinical stroke	0.114	0.089	0.313	1.285	0.206
Dependent Variable: Non- complaint medical treatment with hydroxyurea					

There was positive correlation between non-complaint medical treatment with hydroxyurea and risk for cognitive decline, MRI brain, EEG abnormalities and stroke with the highest predictive value for MRI Brain abnormalities risk (Beta: -1.075).